**PLYMOUTH UNIVERSITY**

**MODULE CODE: CNET343SL**

**TITLE OF PAPER: Distributed Systems**

**TIME ALLOWED THREE HOURS**

**DATE 13th May 2020**

**TIME** **14:00~17:00**

**FACULTY** **NSBM COMPUTING**

**ACADEMIC YEAR 2019/20**

**STAGE THREE**

**INSTRUCTIONS TO CANDIDATES:**

**Section A**: Answer ALL questions. This section is worth 40 marks in total.

**Section B**: Choose and answer TWO questions from the four available. Each question is worth 30 marks.

This exam is worth 60% of the total module score

*The marks given in brackets are indicative of the weight given to each part of the question*

**Candidates are not permitted to look at the examination paper until instructed to do so.**

**Summer Exam**

**Release to library? Yes**

**Section A: Answer all questions**

Q1. Why is it very important to maintain a shared state in a distributed system? **(08 Marks)**

Q2. Explain the terms Availability and Redundancy. Describe how redundancy improves the availability of a distributed system. **(08 marks)**

Availability

Availability means that give system should have capability to give intended service for user at any time. Therefor system should available to provide service that user requested with

Redundancy

Within a distributed network, keep more than one copy of a system in geographically different location of same system. When redundancy improves the availability of system will increase.

Q3. Explain the purpose of different layers in RMI for invoking a method of a remote object. Supply a suitable architectural diagram in your answer. **(12 marks)**

[SNAP]

Stub and Skelton layer

Stub and skeleton are two objects of two classes which acts as gateway of both sides of the connection which is client side and server side respectively. Stub starts the communication by initializing connection. After stub writes request, transmits and waits for server response. Spine reads, writes and transmits a response. These streams use object serialization

Stub - Client side

Spine – Server side

Remote Reference layer

which uses to transmit lower level transport interfaces and it manages and interpret reference within both sides.

Transport layer

Setting up connectivity and maintain continuous connectivity between both ends

Q4. Explain the terms service provider, service broker and service users in relation to Service Oriented Architecture (SOA). **(12 marks)**

Service Provider – The system or maintainer of one or more services that are made available for users in a registry. Service Broker - A registry that contains several services with related details such as service information and whom may use those.

Service Users – Clients who intend to get or buy services from service providers. Therefore clients has to get metadata and develop background with required client components to get services.

**Section B: Choose TWO questions to answer**

**Question 1**

1. With the aid of a diagram, describe the main components of the architecture of a distributed system. **(08 Marks)**

Service

1. Middleware delivers an abstract layer of support that acts as a building block for the construction of the target application(s). What is meant by this statement? **(06 Marks)**
2. List three advantages of using middleware to develop a distributed system. **(06 Marks)**
3. Replication is the key for high availability. Discuss the High Availability Data Replication (HDR) mechanism. **(05 Marks)**
4. What is meant by the transparency in relation to a distributed system. **(05 Marks)**

**Question 2**

1. Describe the cache consistency problem in distributed file systems. **(05 Marks)**

Cache consistency problem occurs whenever, client receives requested information from a server. Recently accessed such information are stored in cache. If client repeatedly access those files, it handle in locally using cached information. Therefore, with time local copy is changed comparing master copy which is handled by server. Therefor the issue is occurred and it is identified as the cache-consistency problem.

1. Answer the following in relation to the google file system
   1. Describe the purpose of the operation log which is maintained by master server of the GFS **(04 Marks)**

The operation log is used to record users actions within system such as changing files,

* 1. What is the purpose of the chunk server? **(04 Marks)**

As using Linux file system and creating chunks of 64MB

1. Discuss the problems associated with the file shared architecture. **(05 Marks)**
2. What is the difference between a thick-client client-server system and a thin-client client-server system? Discuss one advantage and a disadvantage of both by referring to appropriate example. **(06 marks)**

In a client server architecture, if the most amount of processing related to connection is done by client and Server is only handing client’s data storing responsibilities, the client can be identified as Thick client. However, with thin client, most of processing are done by Server side and client is only making requests and getting responces.

1. What is meant by mobile code architecture? Explain with suitable examples. **(06 marks)**

**Question 3**

1. Explain the following features of Distributed Systems. **(12 Marks)**
2. Scalability

Scalability is important characteristic of distributed system because systems have to overcome its expansion goals in order to support organizational strategies and increasing customer base. therefor systems need to provide availability to such cases. Even systems need to maintain and updated. While supporting to increasing customer base / clients system need to stay efficient by providing necessary availability for clients.

1. Openness

The openness of the distributed system is determined primarily by the degree to which new resource sharing services can be made available to the users. Open systems are characterized by the fact that their key interfaces are published. It is based on a uniform communication mechanism and published interface for access to shared resources. It can be constructed from heterogeneous hardware and software

1. Fault Tolerance

Systems are constantly faces issues like system failures, bugs and many other issues which can cause Sevier downtime which is not good for a distributed system. Consequently, systems like this need to handle proper mechanism to face and mitigate partial failures. System has to overcome such issues by replicating system, distributing components in different machines like wise. Therefore, system will tolerant for unexpected failures.

1. Explain how a distributed transaction based on two phase commit protocol mechanism is faithful to the atomicity principle using a proper diagram. (**08 Marks)**

failures. [SNAP]

1. Describe the concept of full virtualization. **(05 Marks)**

Full Virtualization is a virtualization method that make hypervisor as intermediate layer between Physical hardware and OS with its service requests. Operating systems and its program run on hypervisor and it’s a complete isolation of guest virtual machines from host computer.

1. Describe the advantages of virtualization for a business IT center. **(05 Marks)**

Maintaining Datacenter is a hard and complex process which require enormous amount of resources like hardware and facilities like space, cooling and electricity. When growing hardware resources, it requires more and more facilities. Cause of that companies, organizations enterprises require huge amount of money to maintain such facility. With visualization one physical machine can divide into few virtual machines. Therefore, requirement of physical machine is lower and required facilities will reduce. Cause of that comparatively lower cost required to maintain such facility.

Since virtual server is easily maintainable, immediate recovery options can be applied easily comparing to recovering whole physical server. Therefore, it’s easy to recover small portions which are required to be recovered. For business it’s easier method to recover clients and sails information. It also useful to create replicas.

**Question 4**

1. Explain three reasons why enterprise integration is essential. **(06 Marks)**
2. File transfer is a one approach to enterprise integration. Select and discuss two  
   issues concerning the files that must be addressed for this approach to work**.** **(06 Marks)**
3. What is meant by EAI (Enterprise Application Integration) middleware? **(06 Marks)**
4. *“Cryptographic hash is a one-way function”.* Explain this statement in relation to distributed systems security.  **(06 Marks)**
5. What is meant by multi-factor authentication? **(06 Marks)**